

LOW LEVEL ORGANICALLY BOUND TRITIUM MEASUREMENTS IN ENVIRONMENTAL AND BIOLOGICAL SAMPLES

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The ^3He -ingrowth mass-spectrometry method is being employed for determination of low-level concentrations ($\leq 1 \text{ Bq L}^{-1}$) of tritium in environmental and biological samples. The method has been used to measure tritium concentrations as low as 0.04 Bq L^{-1} in aqueous samples. An organically bound tritium (OBT) measurement study, comparing the conventional oxygen-combustion/liquid scintillation counting (LSC) method and ^3He -ingrowth mass-spectrometry, has been carried out on a variety of samples to verify the accuracy of the later technique for measuring low levels of OBT for environmental dosimetry. Urine bioassay samples from workers chronically exposed to low-levels of tritiated water were collected. The samples were cryogenically processed to separate tritiated water and exchangeable tritium. The dried residues were used for OBT measurements. A portion of the residue ($\sim 2 \text{ g}$) was sealed in an Al-Si (Corning 1724) glass ampoule and stored for about one month to measure OBT by ^3He -ingrowth mass-spectrometry. Another portion of the residue ($\sim 1 \text{ g}$) was combusted for OBT measurement by the LSC method. The data showed that the two methods produced comparable OBT concentrations of $5.0 \pm 0.5 \text{ Bq g}^{-1}$ of dry matter. Dilution of the contaminated urine samples by factors of 10- to 1,000-times, and storage of the dry residue of samples for a month yielded almost similar results (4.3 to 4.6 Bq g^{-1} of dry matter) by ^3He -ingrowth mass spectrometry. However, the oxygen-combustion/LSC method was unable to measure OBT in the diluted samples. This comparative study has demonstrated that the reliability and reproducibility of ^3He -ingrowth mass-spectrometry is appropriate and necessary in measuring the expected low levels of OBT ($\sim 0.1 \text{ Bq g}^{-1}$ of dry matter) in the urine samples of the individuals who reside near tritium handling facilities. The measurement data for OBT-in-urine will be useful in estimating the dose contribution from OBT following the intake of environmental levels of tritium.

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